Proposed DeCam Cable Layout

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Introduction

We have been discussing the Megacam design with John Geary who has been most helpful. Our present design (Figure 1) shows straight flat cables brought out from each CCD to mating connectors on the vacuum feed through PC board. The cables run at right angles to the CCDs so that cables cross over connectors of other CCDs as they are routed. This could require removal of some cables to get at the connectors for others. The one straight cable per CCD does not make use of the possibility of a flat cable to route any CCD to any face of the detector through proper design. This note explores other cable configurations.

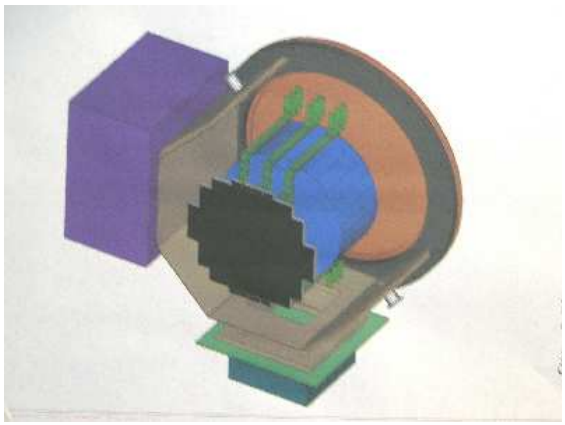

Figure 1. Present Design

The Megacam Cables

The Megacam cable (Figure 2) has a number of interesting and clever features. One vacuum feed through connector drives 3 CCDs. There are parts on the cable to protect the CCD. There are temperature gradient areas built into the cables. There are stiffeners applied to the cables. There is a ground plane design that provides a good signal ground while also providing a long thermal path.

Many signals are common to the CCDs. We need a few devices to make tests to understand which signals can be common and which signals require individual adjustment. It is certain that a lot can be common. The clocks for one item must be common or there will be noise problems. We can anticipate that we might drive 3 to 5 AlN CCD connectors from one 50 pin connector.

John Geary puts protection components on the cable. I would prefer to put them on the AlN board, but this is probably not possible. The AlN board is permanently attached to the CCD, so the protection cannot be removed. The cable can be unplugged from the CCD and if proper procedure is not followed it is possible to zap the CCD while connecting the cable. One does what one can, and protection parts on the cable are better than parts past the next connector. John did not report out gassing problems from a hundred or so parts on the Megacam cables. So it is possible to put parts in the dewar.

The dotted section at the top of the cable is a nice scheme to provide a ground plane and thermal isolation at the same time. The inner two printed circuit levels contain a ground plane. The ground planes zig-zag across the cable so that there is complete coverage with a very long effective ther-

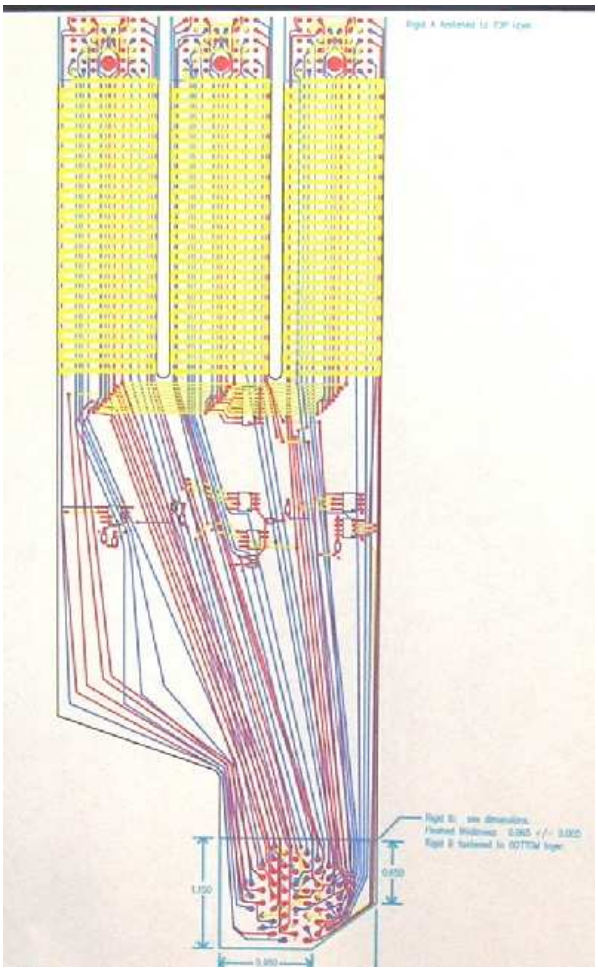

Figure 2. Megacam Cable

mal path. Not indicated in the Megacam design is any cross connection between the two ground planes. It should be possible to connect the two sides every cm or so to improve the ground plane with no effect on the thermal path. A long section with no crossovers might be expected to ring with a pretty high Q after a clock transition. This might put noise into the output.

Stiffener plates are glued to the cable at each end to provide strain relief. This was done by the cable fabricator (Cirexx) and there was no problem with the glue used. This suggests that if parts are added to drive the clocks or to provide a preamplifier that the area used might be backed up to prevent flexure from popping parts off the cable.

A Possible DeCam Cable Configuration

Figure 3 is a sketch of the CCD layout. No effort has been made to conform to the proposed layout. The difference in this layout is that the cables (shown in red) are routed at right angles to the layout (it appears) of Figure 1. The CCDs are 33.75 mm wide. If we rout 25 mm wide cables between the columns of connectors, this leaves an 8.75 mm wide lane for access to the CCD connectors and for access to the mounting pins. This is also a path where thermal connections might land.

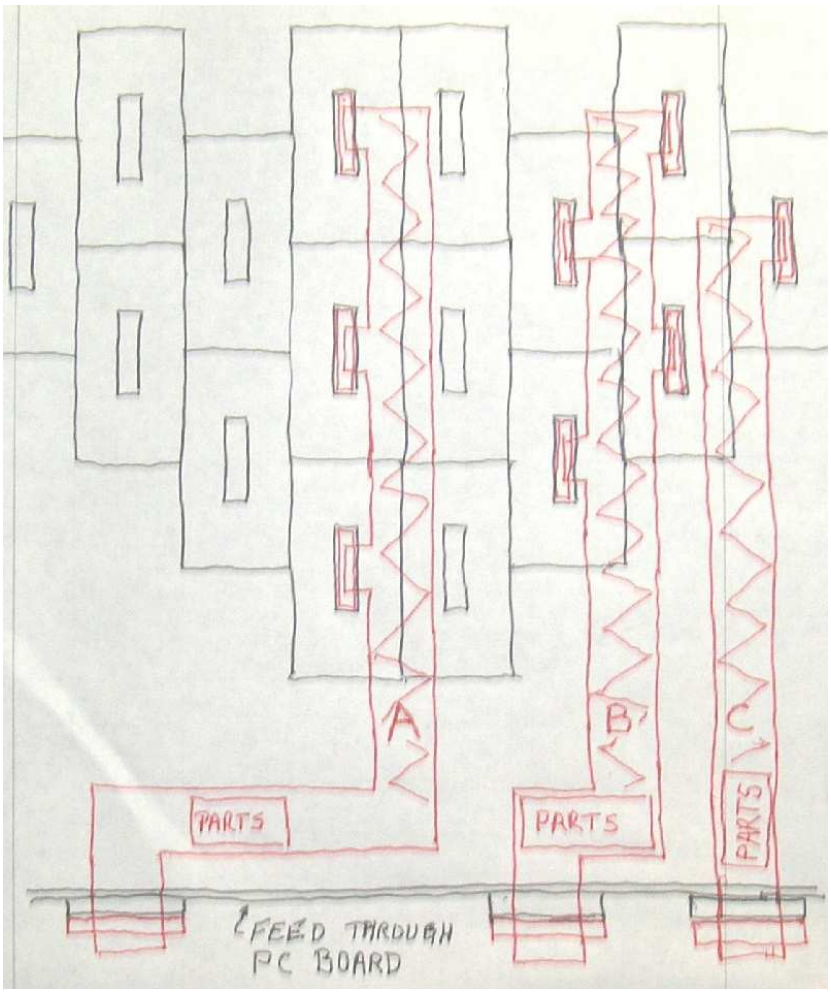

Figure 3. A Proposed DeCam Cable Layout

A cable such as A runs up the column and connects to several CCDs. Using 0.006” conductors on 0.006” spacing allows room for plenty of wires. It is estimated that one cable such as A could supply all the CCDs in the column to the center of the detector. This would allow removing any CCD without having to move any cable. Any cable could be replaced without having to move any other cable.

A cable such as A can be offset to reach any connector position on the vacuum feed through printed circuit board. Flat cable technology is such that the design is not restricted to straight out the side paths such as A or C but the cable could be designed to come out of the 45 degree face at a small increase in length. Not recommended, but is would be possible without twisting or putting stress on the cable. While this type of routing may require several different cable layouts, this is just CAD work, and is not expected to be particularly difficult.

With a cable design like B, two columns of CCDs can be driven from one multi-pin connector. This would leave every other column open for use by thermal contacts and the like. It is just a question of matching available connectors to the number of connections required. We don’t yet know what is needed to make this decision. A 25 mm wide cable would allow space for all the connections we might need.

The zig-zag marked area on the cables of Figure 3 is composed of fine conductors and a zig-zag ground plane. This provides the thermal drop between the CCD and the near room temperature protection components which are labeled “parts”. The ground plane is continuous under the protection components and provides a thermal path to the outside of the dewar through the connector pins. Unless a pre-amplifier is put in this area, the expected dissipation is close to zero.

Driving several CCDs from one vacuum wall connector reduces the number of connectors needed. Instead of the 36 connectors per side indicated by Figure 1, we might get by with 12 or less on each side. This could be a row of six on each side of the slot or two rows of three on each side of a shorter slot.

Since John Geary seems to be successful in gluing a backing on the cable, I would consider gluing a backing board behind the protection parts. This would prevent cable flexure from popping parts off the cable.

Conclusion

It is possible to wire the detector using a single layer of flat cables. This will allow changing any CCD or any cable without disturbing other connections.